

## Modern Trends in Public Health Quarantine\*

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Although not strictly on an entomological subject this paper suggests trends which may be of value to other phases of quarantine. Five of the six quarantinable diseases recognized by the World Health Organization (WHO) and the Public Health Service involve insects in their transmission and therefore are of particular interest to entomologists.

In recent years progress has been made toward streamlining quarantine procedures. Old-fashioned quarantine techniques are of little value with the enormous growth of sea, land, and air travel. In this jet age it is imperative that practices keep pace with modern knowledge of disease and the increased speed and facilitation of world travel. The present century has seen great progress in the knowledge and control of disease and a marked reduction in the geographical distribution and incidence of the quarantinable diseases. The day may come when quarantine barriers between nations may no longer be necessary. At least that condition with freedom from unwarranted obstruction to travel should be the ultimate goal.

### HISTORICAL NOTE

The relationship of the spread of disease to travel has been recognized for centuries. Quarantine has had a colorful history from the early harsh procedures of banishment and even death to the present immunization requirements and worldwide cooperative efforts through the International Sanitary Regulations to ensure maximum security against the spread of disease. As early as 1348 Venice established a system for treatment of ships, travelers and merchandise (1). All goods belonging to infected persons were required to be burned. At the beginning of the 15th century Venice set up a quarantine station or "lazzaretto," a practice followed by other cities and countries (2). In 1710 England put into effect a quarantine act under which ships from areas where plague was prevalent were burned by sanitation authorities. A 40-day period or "quarantenaria" early became established as the usual period of isolation of travelers and goods suspected of harboring disease.

Likewise quarantine in Hawaii has had a colorful history. A number of serious epidemics resulted from disease brought in from the outside to the non-immune population. The quarantine law of 1846 had the following as its concluding

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statement: "If any man does in reality violate any of the above laws and do it knowingly and with evil intent and with the design of transgressing the law and in consequence of his doing this a contagious disease is communicated on shore, whosoever does this is a murderer and shall be hanged."

Briefly some of the highlights of Hawaii's quarantine history as extracted from files of the Honolulu Quarantine Station are as follows:

1. In the measles epidemic of 1848-53 more than 10,000 people, or one-tenth of the population, died.
2. 1853. A smallpox epidemic with 2,109 deaths occurred on the island of Oahu. An edict called for all able-bodied men to render assistance in burying the dead without pay. Persons refusing were subject to \$25 fine.
3. 1869. The first quarantine station was established on the reef west of Honolulu harbor.
4. 1895. Cholera appeared in Honolulu. Two persons died in quarantine from a vessel from Yokohama. Sixty-four deaths occurred later in Honolulu.
5. 1898. First commissioned medical officer of the U.S. Marine Hospital Service was stationed in Honolulu.
6. 1899. First case of plague appeared, followed by 80 deaths during the first three years. Dwellings were burned when considered foci of infection.
7. 1902. More than 11,000 persons were detained in observation at the quarantine station, and 12,000 pieces of baggage were disinfected.
8. 1911. Yellow fever appeared. A case occurred on a vessel from Manzanillo, Mexico. A quarantine guard became infected but no further cases developed.

#### PUBLIC HEALTH SERVICE FOREIGN QUARANTINE

The division of Foreign Quarantine of the U.S. Public Health Service has the responsibility of enforcing regulations to prevent the importation of communicable diseases of man into the United States. This may involve the inspection of persons, conveyances, and things and is accomplished through 28 major and a number of minor quarantine stations. The character and thoroughness of examinations are based on an evaluation of the dangers involved.

Present practices include the visual inspection of arriving passengers for evidence of disease and the checking of vaccination records. Emphasis is placed on the six so-called "quarantinable diseases," plague, typhus, cholera, yellow fever, smallpox, and relapsing fever. Smallpox immunization is required of all foreign arrivals with the exception of a few exempt areas. Yellow fever and cholera vaccinations are required for travelers arriving from areas where these diseases are present. Other immunizations are recommended for certain areas.

Restrictions are also placed on certain animals, vectors, and objects which might be sources of infection to man: dogs, cats, monkeys, psittacine birds, lather brushes, etiological agents, and arthropod vectors. Conveyances are also checked to insure sanitation standards and freedom from rodents, insect vectors, and other vermin (3).

According to figures of the Department of Health, Education, and Welfare more than 7,000,000 persons from the United States traveled in foreign countries (4). Foreign quarantine records for the fiscal year 1960 indicate that 2,165,644 persons arrived by air on 70,383 inspected aircraft; 33,180 surface vessel inspections were made of 1,967,997 persons. Out of these numbers only 37 persons were detained in isolation in 1960 compared to 607 in 1959. A larger number, 54,459, were allowed to continue to their destination subject to medical surveillance for a time.

To obtain a picture of the itineraries of international air travelers arriving at U.S. ports of entry, a survey was made of sample flights at 14 selected airports in late 1960. Results indicate that 9,798 passengers visited a total of 114 different countries during the 14 day period prior to arrival (5). Arriving passengers had visited an average of 1.6 countries each; 2.7 percent lacked valid smallpox certificates and 2.8 percent were issued surveillance notices. Quarantinable diseases were reported in many of the countries visited by the passengers included in the survey.

The last outbreak of a quarantinable disease in the U.S. traced to international traffic was an outbreak of smallpox in 1947 in New York City. With the increased speed of travel, persons and organisms can come from almost any part of the world within a matter of hours. Infected persons may arrive within the incubation period of a disease before symptoms appear and vectors of disease-causing agents may arrive in viable condition. Thus, disease outbreaks in any part of the world are of vital concern to all. With the volume of traffic constantly increasing one cannot afford to be complacent as long as significant outbreaks of infectious disease are still occurring in other parts of the world. Quarantine workers, however, realize the impossibility of erecting an impenetrable barrier against the entrance of disease or vector and still allow free movement of traffic and commerce.

#### STATUS OF QUARANTINABLE DISEASES

At this point we shall review briefly the present status of the quarantinable diseases. The incidence of diseases has been gradually decreasing and the areas of the world reporting them have been growing smaller.

*Plague.* Preliminary figures indicate 83 deaths in 1959 and 65 in 1960. International seaports and airports throughout the world remained free of plague during 1960 (6). Almost all human plague reported during the year refer to isolated cases or to small outbreaks in the interior of the countries. The disease is still present in rats and other rodents in some areas of Asia, Africa, and the Americas and is only occasionally spread to the human population.

*Cholera.* Normally cholera is not found outside of India, Nepal, and East Pakistan, but appeared also in Burma, West Pakistan, and Afghanistan during 1960. Less than 30,000 cases were reported in 1960 with cases in 10 towns with ports and airports (7). A recent outbreak in July of 1961 in Sarawak with 23 cases and 11 deaths were reported in the Kuching area. This is the first time that

cholera has appeared in Sarawak since 1902. At this writing cholera has again appeared in Hongkong resulting in quarantine restrictions being placed on passengers entering and leaving that international port. The improved sanitation in most countries as well as in international transport facilities has made the spread of cholera more and more improbable.

*Yellow fever.* The importance of yellow fever in the present century has greatly diminished although devastating epidemics occurred in earlier history. The disease is present only in an endemic zone across central Africa and northern South America and no cases have been reported for many years whose origin could be attributed to international travel. Widespread vaccination and mosquito eradication have served to reduce the threat of both the sylvan and urban forms of yellow fever. In 1960 human cases were reported to WHO in the Congo, Bolivia, Colombia, Peru, Venezuela, and Brazil (8). In 1959 the epidemic form appeared in Ethiopia and the Sudan and again in April of 1961 Ethiopia reported an epidemic with some 3,000 persons believed dead. No evidence of activity of the virus was reported in 1960 in Central America where the disease made its appearance in recent years.

*Smallpox.* The number of cases of smallpox reported to date for 1960 is approximately 51,000, a decided decrease over any previous year due to improvement in East Pakistan and India (9). This disease remains much more widely scattered over the world than the other quarantinable diseases, although the list of nations free of smallpox is growing. Many airport and seaport cities report smallpox cases.

Smallpox seems the disease most likely to be transported from one country to another due to the long incubation period and the slight symptoms which sometimes appear. During 1960 the disease was imported by sea from the Persian Gulf and Calcutta to Suez and by air from India to Great Britain, and from India to Moscow where a small epidemic resulted. So far in 1961 some additional cases have come to light. It was again introduced to Moscow by a traveler from Delhi, India, in April but was limited to the one imported case (10). A child traveling by air from Bombay to Madrid in January died from smallpox. All possible contacts were sought out, vaccinated, and placed under surveillance (11); fourteen secondary cases developed from the importation. In March a case of smallpox was imported from India to Ansbach, Bavaria by air. Three secondary cases with one death were later reported (12).

The other two quarantinable diseases, louse-borne relapsing fever and louse-borne typhus fever are of little significance in international quarantine. The development of good public health practices and the use of modern insecticides have contributed to their diminishing importance. Louse-borne relapsing fever is currently reported only in Ethiopia. Present infected areas for louse-borne typhus fever include South Africa, Ethiopia, Egypt, Ecuador, Mexico, Korea, and Yugoslavia.

## MODERN TRENDS

*Pre-embarkation indoctrination.* An important recent trend is the indoctrination of travelers before they go abroad. The Division of Foreign Quarantine has recently issued a number of new travel folders giving health hints to travelers. The basic folder gives general information and advice on immunizations and health precautions for the American planning a foreign trip (13). Others give health information for travel in certain countries such as Mexico, Europe, and Asia (14). What to expect and precautions to take in regard to health problems are presented. Another booklet which is constantly revised and kept up to date is the "Immunization information for international travel" which gives the required and recommended immunizations for each country of the world (15). These publications are widely distributed throughout the country, particularly among travel agents and transportation companies. The new procedures stress the responsibility of travelers for having valid immunization records.

*International cooperation.* Among modern trends must also be included the ever-increasing international cooperation as evidenced by the number of nations bound by the International Sanitary Regulations (16). The latest count is 169 states and territories, with or without reservations (17). Improved "epidemiological intelligence" through WHO with more complete, reliable, up-to-date information on the appearance of disease in each nation is basic for intelligent quarantine. The "Weekly Epidemiological Record" of WHO keeps us up to date on the prevalence of the quarantinable diseases throughout the world, as well as other current epidemiological information concerning health conditions. Likewise wireless radio stations regularly transmit WHO radio telegraphic epidemiological bulletins furnishing more immediate reports of disease outbreaks. Cooperation by all countries concerned in promptly submitting the necessary data is desired. Quarantine requirements of more and more countries are coming to conform to the International Sanitary Regulations.

*Sanitary airports.* Recent emphasis on the establishment and maintenance of "sanitary airports" should be pursued. These ports should be kept as free as possible of disease and vectors, with facilities for the care of infected persons, for disinfection, disinsecting, de-ratting, bacteriological examination, and vaccination. Latest notifications of 217 sanitary airports in 96 countries have been received by WHO (18, 19). Twenty-five of these are present in the United States.

The U.S. Public Health Service in cooperation with local vector control personnel maintains entomological surveillance about a number of airports of entry to check on the presence and abundance of insects of medical importance and to determine if new ones are being introduced. This involves the use of various trapping and collecting methods and premise inspections with the institution of necessary control or preventive operations. According to the International Sanitary Regulations member nations are obligated to keep every port and airport area free of *Aedes aegypti* and to keep rodents in port installations to a negligible number.

*Vessel and aircraft sanitation.* Increased stress is being placed on improved hygiene and sanitation of the ship or aircraft. Cases of food poisoning have occurred on aircraft in recent years. With the countless thousands of meals being served aboard aircraft every day one can realize the problems and difficulties that must be overcome to furnish the traveler with pure food and water. The Public Health Service in cooperation with state and local health agencies conducts thorough, rigid sanitation inspections of airline catering and watering points and publishes lists of those which are approved for use by interstate and international carriers (20).

The Division of Sanitation of the Public Health Service has prepared handbooks on the "Sanitation of airlines" and "Sanitation of vessels in operation" which serve as guides to builders and operators of aircraft and vessels and their personnel in making inspections of such servicing facilities (21, 22). These publications also aid health department personnel in making inspections of such facilities. In order to bring about improvement in airline sanitation WHO has also issued a booklet as the first report of the expert committee on hygiene and sanitation in aviation (23).

*Facilitation.* In addition there is the inevitable trend toward the facilitation of travel with the elimination of barriers between countries. Travelers object to being detained or having to queue for inspection in every new country they enter, especially if the countries are free of quarantinable diseases. Several streamlining methods have been tried in the past and their use may be extended or increased as conditions warrant. Among these are: (a) the use of "radio pratique" or quarantine clearance of a vessel by radio prior to arrival; (b) enroute clearance in which quarantine personnel ride a vessel from one port to another, (c) pre-departure clearance in which the health and immunization record of traveler is determined at port of departure; (d) exemption of certain ports or countries from quarantine measures (U.S. exempts passengers from 12 different countries and territories); and (e) acceptance of "pratique" issued by quarantine officials of one nation by another.

*Eradication concept.* The eradication concept is becoming more prevalent as insect species and human diseases are being eradicated from many areas. *Aedes aegypti*, the urban vector of yellow fever, has been eradicated from many countries of Central and South America making them no longer "receptive" areas. Under article 30 of the International Sanitary Regulations, 103 states and territories are listed as yellow fever receptive areas (24). Continued progress should be made toward eradicating *A. aegypti* from these areas. Malaria has been eradicated from many countries of the Americas while eradication projects are under way in many of the malarious areas of the world (25). A SEATO cholera research laboratory has been set up in East Pakistan to work for the eventual eradication of the disease in its endemic foci. Smallpox has been eliminated from North America as well as from other countries of the world.

*Improved de-ratting and disinsecting methods.* The U.S. Public Health Service has recently gone out of the fumigation business. In exceptional circumstances when necessary fumigation will be done by licensed exterminating firms. In past years fumigation with HCN discoids has been performed for the control of rodents with excellent results by quarantine station personnel. Due to the time and hazards involved and the paucity of rat-infested vessels, it has become impractical to maintain trained fumigation crews. Ratproof construction and maintenance, vessel sanitation, and occasional trapping or poisoning have rendered fumigation unnecessary. Very few modern ocean-going vessels have rodents aboard. During the past year only 12 vessels were encountered at all U.S. ports which were estimated to have more than 20 rats on board (26).

The Public Health Service has always been interested in the prevention of the transportation of insect and arthropod vectors of disease from one area to another and has cooperated with the USDA in developing more effective methods of disinsecting aircraft. Results of inspection of aircraft point up the continuing need of this program to meet the threat of the entry and establishment of exotic medically important insects. New techniques that are being pursued are the air vapor disinsecting with DDVP, the use of one-shot aerosol containers with break-off tips, and predeparture disinsecting.

*Mobile lounges.* Another innovation which may prove helpful is the use of mobile lounges for quarantine clearance (27). A fleet of these lounges is under construction by an American auto manufacturing company in preparation for the opening of the new Dulles International Airport in Washington. The motorized lounge is attached to the doors of aircraft and after loading proceeds to the entrance of the terminal building. The large vehicle may serve as a waiting room for arriving or departing passengers as it shuttles back and forth to the planes. Such a vehicle would make obsolete the construction of long extensions of airport terminal buildings and would keep jet noises and servicing operations away from the terminal.

#### SUMMARY

Quarantinable diseases are receding throughout the world although unsettled conditions in some areas coupled with the population avalanche may cause a resurgence of some of them. Emphasis is placed more and more on confining and controlling diseases where they are. As nations improve sanitation methods and eliminate disease, quarantine barriers between them become unnecessary. The governments of 59 countries reported to WHO that no cases of quarantinable diseases due to or carried by international traffic occurred in their countries last year (19). This includes most of the countries surrounding the Pacific basin. Continuing efforts are being made to keep quarantine activities abreast of modern knowledge of disease and means of travel with the least amount of interference with international commerce. Efforts must be maintained to confine and contain

dangerous diseases and vectors within their present limits. As the peoples of the world become more mobile and penetrate new and undeveloped areas more frequently, they will be exposed to more exotic diseases and vectors. An explosive outbreak could possibly follow the bringing of such a disease to a relatively non-immune population. The health services of the United States and WHO are constantly alert to the problems involved and continue to search for new and better techniques to cope with the problem of disease transportation.

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